

REMARKS

This Amendment amends the specification and Claims 1, 8, 9, 11, and 15. Now in the application are Claims 1-18, of which Claims 1, 8, 11, and 15 are independent. No new matter has been added. Support for the amendments can be found on page 11 of the Specification; on page 13 of the Specification; on page 17 of the Specification; in Figure 1; and through out the remainder of the Specification. The following comments address all stated grounds for rejection, and place the presently pending claims, as identified above, in condition for allowance.

4,14,18

Specification Amendments

Applicants amend the specification to address the Examiner's objections to Figures 4A and 5A. Specifically, Applicants correct ministerial errors relating to reference element "S3" and adds an additional sentence to page 15, line 3 that defines the element "h" recited in Equation (3) with more detail.

Claim Amendments

Applicants note that the amendment to Claim 9 expressly address the rejection under 35 U.S.C. §112 and is not directed to any art rejection. Accordingly, Applicants understand that any further rejection of Claim 9 based on new art is to be non-final.

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Drawing Objections

Figures 4A and 5A are objected to for failing to comply with 37 CFR 1.84(p)(5) because they include reference signs not mention in the description. Applicants amend the specification to address a ministerial error. Accordingly, the specification now includes mention of the reference signs illustrated in Figures 4A and 5A.

The drawings are further objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include reference signs mentioned in the description, namely, element "a₁₁" discussed on page 8, lines 12 and 20 of the specification. Applicants contend that no drawing changes are required for element "a" is illustrated in Figure 2. The specification on page 8, line 17 defines as the distance to the object in a selected window. For example, in window "W₁₁" the distance to the object is referred to "a₁₁" to distinguish that the distance "a", as illustrated in Figure 2, is associated with window

“W₁₁”, illustrated in Figure 3(b). As such, a distance value associated with window “W₁₂” is referred to “a₁₂”, and a distance value associated with window “W₂₁” is referred to as “a₂₁”, and so on. Accordingly, consider the drawings to comply with 37 CFR 1.84(p)(5) and contend that no amendment to the drawings is required. Applicants respectfully request the Examiner to reconsider and withdraw the objection to the drawings.

Rejection under 35 U.S.C. § 112

Claim 9 stands rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicants regard as their invention. Specifically, the limitation “the content” lacks antecedent basis. Applicants’ amend Claim 9 to remove the limitation “the content” and substitute in place thereof the limitation “data held by”. Accordingly, Applicants’ request that the rejection of Claim 9 under 35 U.S.C. § 112 be reconsidered and withdrawn.

Claim Rejections under 35 U.S.C. Section 102

Rejection of Claims 1, 11-13, 15, and 16 under 35 U.S.C. Section 102(e):

The Office Action rejects Claims 1, 11-13, 15, and 16 as being anticipated by U.S. Patent No. 6,487,303 of Yamaguchi, *et al.* (hereinafter “Yamaguchi”). Applicants respectfully traverse this rejection on the basis of the following arguments, and further contend that Yamaguchi fails to disclose all elements of these claims, as described below, and hence, does not anticipate the claimed invention.

Summary of the Claimed Invention

Applicants’ invention is directed to object recognition systems and object recognition methods for recognizing an object in front of a vehicle. Each system and method is capable of recognizing objects using a plurality of windows in images captured using one or more sensors mounted on a vehicle. The object recognition systems and object recognition methods of Applicants’ invention address the recognition errors caused

by measurement errors introduced due to a vehicle's pitch or roll when a vehicle travels up a grade or down a grade, or when the attachment point or the installation angle of the camera changes from an initially installed position.

Summary of the Yamaguchi Patent

The Yamaguchi patent discloses an object detector for distinguishing between a road of travel and an obstacle in an image using a distance image when a vehicle is traveling.

The Claimed Invention Distinguishes Patentability Over The Yamaguchi Patent

Claims 1, 11-13, 15, and 16, as amended, are not anticipated by the cited Yamaguchi patent. Amended Claims 1, 11, and 15, recite an object recognition system, an object recognition method, and an object recognition system, respectively, that compare measured distances for each window of a captured image with an estimated distance to the road surface for each window to determine if the measured distances corresponds to the road surface. Each claimed object recognition system and object recognition method further estimate inclination of the vehicle based on the measured distances that are determined to correspond to the road surface. Accordingly, based on such estimated inclination, the estimated distances are modified.

Claims 12 and 13 depend, directly or indirectly, from amended Claim 11 and thereby incorporate the novel features of amended Claim 11. Claim 16 depends from amended Claim 15 therefore incorporates the novel features of amended Claim 16. Accordingly, the arguments asserted below with respect to amended independent Claims 1, 11, and 15 are equally applicable to each corresponding dependent claim.

The cited Yamaguchi patent, in contrast, compares pixels from two images to determine a distance image and derives a road surface from the distance image by determining a two-dimensional distribution of pixels in the distance image. Yamaguchi does not compare measured distances for each window in a captured image of a road surface with an estimated distance to the road surface for each window to determine if the measured distances correspond to the road surface. Furthermore, Yamaguchi does not

estimate an inclination of the vehicle based on the measured distances that are determined to correspond to the road surface and use the estimated inclination to in turn modify the estimated distances.

Consequently, the system of amended Claim 1; the method of amended Claim 11; and the system of amended Claim 15 are not anticipated by the Yamaguchi patent. The Yamaguchi patent discloses a system having an operation and structure distinct from the systems and methods recited in amend Claims 1, 11, and 15. Yamaguchi is not concerned with modifying estimated distances using an estimated inclination of a vehicle.

Accordingly, Applicants' request the Examiner to reconsider and withdraw the rejection of Claims 1, 11-13, 15, and 16 under 35 U.S.C. §102.

Claim Rejections under 35 U.S.C. Section 103

The Office Action rejects Claims 2-10, 14, 17 and 18 as being unpatentable over Yamaguchi in view of U.S. Patent No. 5,638,116 of Shimoura, *et al.* (hereinafter "Shimoura"). Applicants respectfully traverse this rejection on the basis of the above amendments and following arguments, and further contend that the combination of Yamaguchi in view of Shimoura fail to teach or suggest all elements of these claims, as described below, and hence, does not obviate the claimed invention.

Summary of the Shimoura Reference

The Shimoura reference is directed to an object recognition apparatus that relies upon a single point in an image, that is, the vanishing point, to determine the pitch, roll, and yaw of a vehicle on a roadway. The vanishing point is defined as the point at which the road vanishes in a captured image. *See*, Column 16, lines 3 and 4, of Shimoura.

The Claimed Invention Distinguishes Patentability Over The Cited References

Claims 2- 7 depend, directly or indirectly from amend Claim 1 and thereby incorporate the novel features of amended Claim 1. Claim 8 is amended by this amendment to include a means for comparing that compares a measured distance with an estimated distance for each window in a captured image of an object. Claims 9 and 10 depend from amended Claim 8 and therefore incorporate the novel features of amended

Claim 8. Claim 14 depends, directly or indirectly, on amended Claim 11 and hence, therefore incorporates the novel features of amended Claim 11. Claims 17 and 18 depend, directly or indirectly, on amended Claim 15 and thereby incorporate the novel features of amended Claim 15.

As discussed above the Yamaguchi reference fails to disclose each and every element of amended Claims 1, 11, and 15. Further it is recognized from the Office Action that the Yamaguchi reference fails to disclose each and every element of Claim 8. The Shimoura reference fails to bridge the factual deficiencies of the Yamaguchi reference. Shimoura relies upon a single point in an image, that is, the vanishing point, to determine the pitch, roll, and yaw of a vehicle on a roadway. Neither the Yamaguchi reference nor the Shimoura reference disclose, teach or suggest a system or method for recognizing an object in front of a vehicle that compares measured distances for each window in a captured image of a road surface with an estimated distance to the road surface for each window to determine if the measured distances corresponds to the road surface.

Accordingly, neither the Yamaguchi reference nor the Shimoura reference detract from the patentability of amended Claims 1, 8, 11, and 15 because each cited reference, alone or in combination, fails to teach or suggest each and every element found in these claims. Moreover, it appears that Shimoura reference teaches or suggests an operation distinct from the Yamaguchi reference that if combined would change the operation of the Yamaguchi reference. The Shimoura reference teaches the averaging of a number of road vanishing points to provide the yaw angle and pitch angle of a vehicle. See, column 30, lines 15 – 21 of the Shimoura reference. In contrast, the Yamaguchi reference teaches an operation to determine pitch in a captured image that plots a distance value for each pixel or groups of pixels in an image to determine a distribution of distances and then searching the distribution for those pixels the bottom point (points having the smallest Z value) in each region of the distribution. See, Column 7, lines 37-45 of Yamaguchi. Accordingly, Yamaguchi teaches a principle of operation and construction that requires a plurality of points taken from all regions of an image to determine an inclination while, in contrast, the Shimoura reference teaches an operation and construction that uses a point or points taken from a highly distinct region, specifically,

the vanishing point of a captured image. Hence, the Examiner's proposed modification of the Yamaguchi reference in view of the Shimoura reference changes the principle of operation of the Yamaguchi reference and therefore provides no motivation for one skilled in the art to combine references.

Accordingly, the Yamaguchi reference and the Shimoura reference, alone or in combination, fail to establish a *prima facie* case of obviousness to detract from the patentability of Claims 2-10, 14, 17 and 18. Neither the Yamaguchi reference nor the Shimoura reference, alone or in combination, teach or suggest each and every element of Claims 2-10, 14, 17 and 18. Further, the cited combination of references lacks any motivation to combine for the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified. Hence, Applicants' respectfully request the Examiner to reconsider and withdraw the rejection of Claims 2-10, 14, 17 and 18 under 35 U.S.C. §103.

CONCLUSION

For the foregoing reasons, Applicants contend that Claims 1-18 define over the cited art. If there are any remaining issues, an opportunity for an interview is requested prior to the issuance of another Office Action. If the above amendments are not deemed to place this case in condition for allowance, the Examiner is urged to call Applicants' representative at the telephone number listed below.

Respectfully submitted,
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